1996 Comparative Analysis of Enterprise (Micro) Data Conference Program

Plenums

Firm Performance and Evolution: Empirical Regularities in the Microdata

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The main purpose of this paper is to explore what we know and how we think about firm performance, firm and industry evolution, and economic growth. To this end, we report empirical findings from a new literature that explicitly focuses on individual firms and business units. This literature has been spurred by recent theoretical developments and, perhaps more importantly, the word-wide development of longitudinal microdata that tracks individual firms and business units over time. In contrast to traditional empirical studies of competition and economic growth that examine aggregate economic variables such as industry or regional productivity, this new work concentrates on differences in the behavior of firms and their business units. The results emerging from these analyses confirm the importance of microeconomic approaches to economic research and place the firm at the center of economic growth.

The idea that differences in firms are important to understanding economic growth and the performance of capitalist economies is not new to economist. Schumpeter (1942) describes the process by which competition produces economic growth and improvements in living standards as one of "creative destruction". Firms constantly search for new products and new ways of doing things and all to try to gain comparative advantage.

Statistical Methods and Models for the Analysis of Cross-Cultural Data

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Comparison of regions, countries and cultures can be a useful method to gain insight into societal structures and processes. Typically, such comparisons have been based on aggregate data. Through the collection of multiregional and multicultural data sets on the individual level it is possible to gain deeper insight by analysing whether complex multivariate associations that are found in one region or culture also hold for other regions and cultures. A special problem occurs in the analysis of individual data from

questionnaires because the data are often measured on a dichotomous or ordinal level as opposed to a metric level. Consequently, this paper treats statistical models for mean and covariance structures with metric and/or non-metric dependent variables.

Productivity, Efficiency and Performance

Total Factor Productivity Measurement with Microdata: Recent Approaches and New Directions

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In recent years there has been a dramatic increase in the amount of productivity research that uses longitudinal micro- level datasets. The increase owes to displeasure with the concept of the aggregate production function, more widespread availability of micro-level data, the development of a rich theoretical and analytical micro-economic foundation, and mostly because of a host of interesting questions which can be better addressed with microdata. In this overview we discuss what has been learned in the past few years, and relate the importance of the new findings for other fields in economics, such as macro, labor, and, trade. We provide an overview and critique of the methods used to measure productivity at the micro level. Further, we touch upon observed productivity dispersion, measurement of returns to scale and substitution elasticities, the effects of changing industry composition, and the role of industry dynamics, among other topics.

Japanese Experience of Longitudinal Datasets Analysis and International Perspectives

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This paper presents an overview of Japanese case of longitudinal dataset compilation and analysis, based on MITI's Manufacturing Census and Basic Survey of Business Structure and Activities. Auther has compiled two kinds of panel data, manufacturing census panel at the establishment and R&D panel at the firm level, by linking micro-data of MITI's census surveys. The first part of this paper is for description of Japanese longitudinal datasets based on existing microdata. Furthermore, the second part of this paper presents two on- going international comparable research projects with Japanese data. (1) France, Japan and US comparison of job turnover and productivity distribution and (2) France and Japan comparison on technology and productivity. Although both of projects are still on-going, some preliminary results as well as issues associated with international comparative longitudinal dataset analysis are provided.

Australian Business Longitudinal Survey

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Measuring the Impact of the Manufacturing Extension Partnership

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In this paper, I measure the impact of the manufacturing Extension Partnership (MEP) on plant performance. The MEP is administered by the National Institute of Standards and Technology (NIST) as part of their effort to improve the competitiveness of U.S manufacturing. The program provides business and technical assistance to small and medium sized manufacturers much as agricultural extension does for farmers.

The goal of the study is to see if measures of plant performance (e.g., productivity and sales growth) are systematically related to participation in the MEP, while controlling for other factors that are known or thought to influence performance. To do this, I match MEP client data to the Census Bureau's Longitudinal research Database (LRD). The LRD contains data for all manufacturing establishment in the U.S. and is, therefore, an individual resource for constructing control groups for studies such as this one. The LRD provides a number of measures of plant performance and characteristics that are measured consistently across plants and time. This facilitates valid comparisons between client and non-client plants and between clients served by different MEP centers.

Selection bias is often a problem in studies such as this. Therefore, I specify an econometric evaluation model that allows me to test and control for selection bias. To estimate the model, I use data from (manufacturing centers in 2 states. the control group includes all plants from each state in the LRD.

Productivity, Wages

Union Recognition and Union Status

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This paper uses a matched panel of establishments and workers to investigate the status, and associated wage effects, for union workers. In the UK, the union status of an

individual, where it affects the pay and conditions of the individual worker, is the result of a two stage decision process. Union recognition by employers is a voluntary act. Conditional on the employer recognising the union, the worker then has to decide whether or not to join the union at the workplace. We develop a random effects probit model, that takes account of the sampling of the population to obtain the data, simultaneously estimates the recognition decision, the workers membership decision, the implied effects on the queue for jobs and the quits by employees, the workers job tenure, and the remuneration to employees. The framework allows us to test for the significance of the random effects, and their correlation with the observable variables. We recover the effects of the unobservables in the equations using a simulated moments technique from McFadden (1989).

The results find that employer unobservable effects are more important than individual unobservable effects in determining the union status of workers. Employer unobservables play a large role in the number of application and quits, in the job tenure of workers, in a workers union membership decision, and in their remuneration.

Wage Formation in Portugal

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Andrew Dickerson, United Kingdom

The study of wage formation in Portugal has received very little attention to date. The primary motivation of this paper is to begin to fill the gap in our knowledge about wage formation in the portuguese labour market.

The paper is therefore concerned with identifying the relevant factors in the wage determination process in Portugal concentrating on the relationship between wages and produtivity which is a particularly important issue specially in the context of the increasing international competition faced by firms since Portugal joined the EC in 1986.

The paper is organised as follows. Section 1 is an introduction where we present the main features of the portuguese labour market that have to be taken in consideration in the moddeling of the wage formation.

Selection 2 outlines a theoretical structure which we believe captures the important features of portuguese wage setting behaviour and follows the insider-outsider approach of NICKELL & WADHWANI (1989) where wages are seen as a convex combination of insider and outsider variables. Insider variables include alternative wages and the level of unemployment.

The data used in this study are derived from a unique panel of portuguese manufacturing firms from 1986 to 1991, collected by the Bank of Portugal. The data consists of the balance-sheet of over 1.5 thousand firms. Section 3 reports some basic characteristics of

this data and the estimation technique used. We use the GMM estimator of ARELANO & BOND (1988, 1991) to estimate the model outlined in section 2.

The results follow in section 4. The magnitude of insider factors is not dissimilar to that found in a number of other studies (NICKELL & WADHWANI (1989); HOLMLUND & ZETTERBERG (1991)). The insider weight is therefore robust to some changes in specification such as the use of regional unemployment levels with regional dummies instead of the area unemployment rate or the replacement of the aggregate variables by a set of time dummies.

The paper concludes with some comments on the implications of our findings.

R&D and Productivity Growth. Evidence from Firm- Level Data for the Netherlands

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G. van Leeuwen* (Statistics Netherlands)

H. Nieuwenhuijsen (Statistics Netherlands)

This paper presents a first attempt to estimate the contribution of R&D to productivity growth on firm-level data for Dutch manufacturing, using a production function framework. The data are sourced from the four-yearly R&D surveys of 1985, 1989 and 1993 and the Production Statistics for the same years. After discussing the characteristics of the data we present estimates for several constrained and unconstrained productivity relations with the R&D knowledge stock and the R&D intensity as a separate input. We distinguish between two periods: 1985-1989 and 1989-1993. For each period, and for the pooled data, we estimate "long difference regressions" to correct for fixed firm level effects. It is shown that the biases due to selectivity of the R&D surveys and simultaneity of labour and output are rather small and that our data suffer from heteroskedasticity in the measure for the growth of the R&D knowledge stock. After correcting for heteroskedasticity and simultaneity we find plausible estimates of R&D and ordinary capital of approximately 0.10 and 0.30 respectively. Assuming zero depreciation for R&D we find an estimate for the rate of return to value added between 0.20 and 0.30.

Technological Innovation and the Labour Relations System in Portugal

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The increasing market demands, mainly after the Portuguese entry to the EEC, and the support of several incentive schemes (both from the Government and from the Community) have brought some modernisation to the Portuguese enterprises.

Nevertheless, this modernisation as become almost restricted to the productive process, with a much more limited impact on the social innovations within the enterprises.

In this paper we present some results on this recent modernization process, with particular reference to the impact of a Community program applied for some years to support the industrial development of the Portuguese industry. Technological innovation and the evolution of the Labor Relations System are then analyzed in this context.

Plant Level Explanations for the Catch-Up Process in Finnish Manufacturing: A Decomposition of Aggregate Labour Productivity Growth

Mika Maliranta* (Statistics Finland / Etlatieto)

The Finnish manufacturing sector has experienced exceptionally rapid labour productivity growth since the mid 80's until recently due to which the average labour productivity level has climbed to the international top group as described in Maliranta (1996). In the comparison of the aggregate labour productivity between Finland and the United States it appeared that the increase of the Finnish labour productivity level relative to the United States was accompanied by an increase in relative capital intensity in Finland. The period from 1990 to 1993 was a period of considerable downsizing in Finnish manufacturing contrary to the US manufacturing sector where labour input has been quite stable.

Plant-level explanations of the accelerated labour productivity growth in the Finnish manufacturing sector are studied in this paper. Aggregate annual labour productivity changes are decomposed into various components. The entry-exit effect is defined as a difference in annual change between two different samples of plants: one including all plants in each year and the other covering only those plants that existed in the both successive years. It turned out that since the mid 80's the entry-exit element played a role in Finnish manufacturing. Especially, an increase in exit-rate has been an influential factor. The second source of aggregate labour productivity change, related to the previous one, arises from the fact that the relative labour input shares of the staying plants change. Plants with above average labour productivity level have increased their relative labour input share so that employment reallocation has a positive effect on the aggregate labour productivity growth. Furthermore, this effect has been increasing during the time span from 1976 to 1994 and was about 2 % per year in the early 90's. The third determinant is a combination of employment reallocation and productivity growth within plants and it is called cross-term. This factor has had a negative effect on aggregate productivity growth, i.e. the relative labour input shares have decreased in plants with above average labour productivity growth.

Entry-exit, labour input reallocation and cross-term together had a minor effect on aggregate labour productivity from 1975 to 1985. In other words, aggregate labour productivity growth and labour productivity growth within plants, which is the fourth component of the aggregate productivity growth, nearly coincided in this period. Since the mid 80's, on the other hand, the three first components together have played an

essential part in aggregate growth. The sustained increase of the labour productivity growth rate since the mid 80's in Finnish manufacturing is based mainly on factors other than plant level growth.

Enterprise Demography, Job Creation

New Firms and Industry Evolution in Finland

Eija Ahola* (VTT Group for Technology Studies, Finland)

Background

Small and medium sized enterprises and specially new and startup firms are seen in many industrialized economies as the key mechanism in economic growth, improving employment and competitiveness of the nations through the renewal of industry. Special programmes and initiatives have been established both with EU and nationally, in order to especially encourage the emergence of new technology based firms.

The number of firms is in Finland c. 260 000, c. 26 000 of these represent manufacturing industry, most of them are small. Every year c. 3 000 new firms are established, and about the same number closes down.

The aim of this paper is to analyse the role of the new firms in their industry. The analysis is based on data of new and established industrial firms in the business register of Statistics Finland.

New firms and industrial life-style

In his book Mastering the dynamics of innovation (1994) Utterback discusses the changes in firm structures during the life-cycle of an industry. In the emerging phase of the industry the number of new emerging firm increases. Due to the dominant design and other factors in the second phase the number of firm decreases, although the volume of the business grows.

Audretsch (1995) has also studied the role of new firms in the development of an industry (Innovation and industrial evolution), and noticed two kinds of new firms, leading to a two-wave-formed industrial life-cycle.

Lovio (Evolution of firm communities in new industries, 1993) studied the evolution of electronics industry in Finland, and developed a model of the role of new firms during the industry's life-cycle. He showed that new emerging firms establish new industries, but the growth of an industry is made in large firms. The roots on businesses are long - large firms acquire innovations and new technology i.e. through buying small firms.

Research problem

These theories assume that the role of new and startup firms is substantial in the renewal process of industry, although all new firms are not innovative nor have any role in the renewal process. The basic question is, whether the changes of the firm structures of industries can be used in analyzing the development phase of that industry, and i.e. in searching new sectors with high growth potential.

The first phase of the research focuses on the entries and exit of firms and business using the statistics and registers of new firms (1986 - 1993). The number of firms, and entries and exits within different manufacturing industries are analyzed, as well as the roots and other registered changes of business within the sectors. the aim of the analysis is to describe and compare different Finnish industries according to their phase on the life-cycle curve, and to evaluate the extent of industrial renewal process in Finland.

The paper will present the structure of new startup firms (in Finland in 1986 - 1993). The analysis is made by the background of the firms, by the industrial sectors, and by the knowledge bases and educational levels of the employees. Through this analysis the number of really new knowledge and technology based firms and the extent of the industrial renewal can be estimated.

The Finnish Manufacturing and Construction Enterprises and Their Employees in the Period 1987-1993 - Enterprise Demography and Job Flows Analysis

Leena Hietaniemi* (Statistics Finland)

The study consider all Finnish manufacturing and construction enterprises being alive in the year 1993. If the enterprise came into existence during the research period then the new rising questions are (i) is that birth real or unreal and (ii) in the case of unreal birth what has happened to the previous "mother" firm. As the answer to the question (i) the analysis produces the map with yearly demography codes for every enterprise. One way to answer to the question (ii) is to use the Finnish enterprise bankruptcy statistics.

The base panel data consists of three different parts: the statistics of the Finnish working population, the Business Register and the Enterprise bankruptcy statistics. The statistical unit is a person. Later it was gathered some variables from the Financial Statements Statistics of Enterprises. The different parts were linked together by the identity code of the enterprise.

The data was then turned to the enterprise level. From that data it was first taken all the enterprises being active throughout the whole period. As a result it was formed a map and these enterprises got the code 'NM' (i.e. normal) in every year. After that all in 1988 born firms were examined and then in 1989 born enterprises and so on. In the map there were used different codes: 'BR' means real birth, 'BR1' is unreal birth etc.

The analysis shows that the percentage of the real births was highest at the beginning of the period and the smallest one in 1991 starting to rise again towards the end of the

studying period. The original panel data shows that some of "mother" enterprise fell into the bankruptcy later in the period.

In Finland the high the high unemployment rate has been a very severe problem in this decade. Gross job creation and destruction figures were also calculated. The net employment change in construction sector was highest in 1988 and lowest in 1992. The labour demand turned to negative in the year 1990.

It can be seen that both of these results follow the economic trend of the Finnish national economy.

Enterprise Demography as a Method of Studying Real Enterprise Births

Tuija Mustaniemi* (Statistics Finland, Business Register)

In this study enterprise demography was applied to study enterprise openings in retail trade and industry. In Finland the enterprise openings covered by the Business Register are administrative. An administrative enterprise opening is not always a real enterprise birth, because an opening may be due to changes in the legal form or the ownership of an enterprise or the changes in employership or VAT obligation. An enterprise opening may also be due to a merger or a demerger. The main object of this study was to find out the share of the real enterprise births of the administrative ones. For the analysis a longitudinal panel data covering the years 1988 - 1992 was created. The data included variables from the Business Register and the Regional Employment Statistics. The observation unit of the data was employee (social security number). The social security number of the employee made it possible to track the personnel of a certain enterprise, because there is a link between the social security number and the enterprise identifier number. There were three criteria for a real enterprise birth. First, the new enterprise has started its activities by creating, not by taking over, an establishment. Second, the most of the employees of a new enterprise must not have come from a certain enterprise. This criterion was used, because a high proportion of same employees between a new enterprise and an old enterprise usually indicates an administrative (false) enterprise opening. Third, the new enterprise had to be economically active. The analysis exposed that only 54 percent of all enterprise openings in retail trade and 63 percent in industry could be classified as real births. It was also found out that these enterprises employed only few employees in the first three years. Two thirds of these enterprises had no other employees but the entrepreneur himself. Furthermore these enterprises had a high level of death-rate. Almost half of them died before the fourth year.

Entry and Exit in Danish Manufacturing Industries

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This paper analyses the entry and exit behaviour of Danish manufacturing firms. In recent years much attention has been paid to especially entry studies but also to exit studies within industrial organisation research. A high degree of firm mobility is important in order to move resources from low productive to high productive industries in the economy. Furthermore, potential entry of new sellers can restrain established sellers from exploiting their market power and from rising their profits. Also the threat of new firms entering the industry forces the established firms to minimize their costs in order to keep entrants out of the market. Finally, a high firm mobility is important as the diffusion of new technology often is correlated with a high entry rate.

Until recently only a few (partial) studies on Danish firm mobility existed which is mainly due to lack of data at firm level. This paper, however, analyses the entry and exit behaviour of Danish firms from 1991 to 1993 based on a newly constructed longitudinal sample of 10,000 firms.

The first section of the paper deals with the data set. Firm mobility is described over time and across industries. In general the data set includes information on 379 manufacturing industries over eight years (1988-1995) at firm level. Based on individual information entry and exit rates are constructed for industries at 5-digit manufacturing industries. The following section of the paper discusses models of entry and exit behaviour. Importance is attached to factors such as industry sales growth, (growth of) profit rates, scale effects and the concentration of the industries. Finally, the last part of the paper includes an econometric study of entry and exit behaviour. The econometric study is performed as one cross-section study over the period 1991-1993.

Job Creation, Enterprise Demography

Were Small Firms the Engines of Growth for Canada's Manufacturing Sector in the 1970s and 1980s

John Baldwin (Statistics Canada)

This paper uses a longitudinal data base that is constructed from Statistics Canada’s Manufacturing Census\Survey to examine whether small firms have been more dynamic than large firms in creating new jobs. It builds on earlier work (Baldwin and Picot, Small Business Economics, 1995) that examines the extent to which alternate measures that correct for the regression-to-the-mean effect the conclusion that net job growth tends to be positive for small Canadian manufacturing firms and negative for large firms. This paper examines wage differences in small and large firms and creates a new job measure that takes these differences into account. Over the period when small firms were growing so quickly that they accounted for an increasing share of total employment, their wages

were increasingly falling behind those of large firms. Using a wage-corrected job measure, the paper shows that the previous conclusions that small firms were the most dynamic factor has to be amended.

Mobility Patterns in the Italian Economy

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Labour mobility in the Italian economy is investigated on the basis of a large panel of workers, observed from 1986 through 1991, each matched to the firm that employed him/her in the observation period. The panel (over 100 000 individuals a year) is a random sample drawn from the administrative files of the Social Security Administration (INPS).

The main result are as follows: (i) inter-firm flows, taking place between firms belonging to the same sector, are very large; inter-sectoral flows are instead modest; (ii) the annual separation and engagement rates are about 32-34 % each: thus, on average, one worker in three leaves his post each year. Contrary to shared options, labour mobility in Italy is therefore quite high compared to that of many European countries; (iii) labour mobility is strongly inversely related to age; manual workers are more mobile than white-collars; women are only slightly more mobile than men; (iv) firm characteristics have a great deal of explanatory power: mobility induced by small firms in much higher than that attributable to large firms; mobility is lower the higher the degree of capital intensity; it is higher in the South than in the North; (v) one fourth of those who separate from a post move into another position within one month; re-entry times, however, increase very slowly: two thirds of those who separate re-entry in less than 3 years; for the remaining one third, the likelihood of being ever re-employed is very low.

Job Turnover in the Israel's Manufacturing Sector 1970-1994

Reuben Gronau (Israel)

Haim Regev* (Israel)

Births and Deaths of Firms in Finland

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Jukka Topi (Bank of Finland)

We examine the process of firm births (entry) and deaths (exit) in the Finnish manufacturing industry. Descriptive statistics are presented on the number of new firms and exiting firms, as well as on entry and exit rates, both across industries and over time. Also the correlations of entry and exit over time are examined. We estimate Poisson and negative binomial models, where the number of entering and exiting firms is explained by microeconomic and macroeconomic variables. The microeconomic explanations of entry and exit are derived from industrial organization theory and macroeconomic explanations from the theory of transmission of monetary policy. The data is a six year panel of three-digit industries in Finnish manufacturing industries, based on the Register of Enterprises and Establishments of Statistic Finland. The results show that scale economies form a significant entry barrier, but the evidence on their role an exit barrier is weaker. Industry growth has a positive influence on entry and a negative influence on exit, but also variables describing the monetary transmission mechanism have an expected influence on entry. Credit supply has a positive and real interest rate a negative effect on entry. However, the role of macroeconomic influences on exit is inconclusive, probably because the exit variable includes both voluntary exit and bankruptcies. past entry has a significant effect on exit, witch reflects the displacement of old firms by new ones and the short life expectancy of new firms. Both entry and exit have almost unit elasticity with respect to industrial size, measured by the number of firms in the previous period.

The Effects of Advanced Technologies on Wages and Employment: Experiences from Finland Using Establishment and Worker-Enterprise Data

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We study the effects of technology on establishment level wages and employment using a classification of the technology levels of industries.

The analyses will be conducted using the two micro datasets constructed at Statistics Finland: (i) a pooled cross-sectional data file of industrial establishments (DIE) for 1974-93, and (ii) a longitudinal worker-enterprise database (WEDB) for 1988-92.

The DIE gives wages separately for manual (blue-collar) and non-manual (white-collar) workers. We have analysed changes over the time period 1974 to 1993 in wage distribution across establishments and in technology effects on wages. The technology wage premiums have been estimated using wage equations with available explanatory establishment variables in DIE on one hand, and adding worker-based variables from the WEDB on the other. The latter analyses, much more detailed ones, have been done for five years only which are very interesting in Finland because of dramatic changes in economy.

The results do not appear to show a straightforward connection between the average wages of manufacturing establishments and the technology level of their industries as far as the high, medium-high or medium-low technology is concerned. However, the establishments in industries with the lowest technology have paid lower wages during the whole period. There are several interesting detailed results arising from explanatory variables.

Keywords: manual and non-manual workers, technology intensity, wage equations

Measurement, Comparability

Diverging Methods Concerning the Production Index

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The production index, which is clearly the most important among all short term indices, provides a good example of diversity of methods. The range of potential **conceptual** differences, for instance as regards the formula for the relevant index (Laspeyres, Paasche, Fisher, etc.) is common knowledge. However, the reality of the European situation is such that this diversity goes much farther: not only is there an argument as to which index concept should be applied but there are also different points of departure as far as **basic information** is concerned. The Commission is frequently taken to task for attempting to harmonise every single thing down to the last detail. In the interests of users of statistics, Eurostat would indeed like to harmonise basic information, i.e., the concept for recording the production index and lay down a specific statutory method, but unfortunately the relevant concepts have evolved historically in the EU Member States over a long period of time and are very difficult to change.

The aim of the production index is to provide a **quantitative measurement** of monthly value added. Since it would be too costly to measure value added each month, this has to be approximated. What basic information concepts are used in Europe?

First, there is the "classic" concept involving the recording of actual **quantities**, i.e., tonnes or pieces. This is the most widely used method. It has the drawback that changes in the quality of products are not recorded with the result that measurements are no longer taken of what really should be measured since, for instance, where product quality improves, the quantity produced may remain the same, so that the index would remain constant, even though the resulting value added is enhanced. Since it is manifestly clear that in very many branches of industry marked changes occur in product quality, this problem cannot simply be glossed over.

The second method involves recording the **production value** of selected products and then deflating them by means of appropriate producer price indices. But are the available price indices of good quality?

Hours worked can be used to approximate production, with or without correction for productivity trends. This concept is applied for certain activities in several countries, in cases where another method is not feasible, e.g., in shipbuilding or aircraft manufacture where products are completed on such an irregular basis that monthly production cannot be recorded.

Lastly, the fourth possibility for obtaining basic information involves recording the **branch turnover** and then deflating it. However, this method does not provide details of production but of turnover, i.e., sales, which as a rule occur later than production or come from stocks. Some Statistical Offices take account of changes in stocks, in order to calculate production on the basis of turnover. However, this correction is not always implemented.

The talk will explain in detail the different methods and discuss the **advantages** and **disadvantages** of each of them.

An Integrated Classification of Products by Economic Activities to Improve International Comparability of Business Data

Giuseppe Puglisi* (National Statistics Institute of Italy)

The activities and products classifications: NACE Rev. 1, CPA 96, PRODCOM 96, CN 96, have been developed within a harmonized European framework define by Council Regulations, in order to make information clearer for operators in the Single European market.

This European classifications system aims to be an integrated system. It means that CPA includes HS/CN references, PRODCOM is considered a list of products without CPA headings that concerns some areas of CPA, but with a greater detail with respect to CPA and, generally, with respect to CN:

The first four digits of CPA, generally, but not always, coincide with NACE Rev. 1 codes.

Nevertheless, despite important improvements, the way that nomenclatures could be considered to incorporate each other, may be considered only partially satisfactory from a substantial point of view.

In order to help users of economic nomenclatures to navigate through the new European classifications, some useful nomenclature servers and data bases have been created.

In order to have a complementary and useful tool, I proposed to Eurostat in the NACE meeting on September 1995 and to ONU in the Geneva Seminar on 19-20 October 1995, that an expanded eight/ten-digit CPA be set up grouping together the CPA, PRODCOM, CN, CPV headings as well as the list of agricultural products contained in CRONOS.

The aim of this expanded CPA is that of building an integrated products classification that could mainly be used for the following reasons:

- To achieve a single nomenclature data-base as opposed to having to access a multiple data-base.
- To know how to classify activities, by products, in addition to explicative notes of NACE Rev. 1.
- To know how to classify new products.
- To ascertain if there are contradictions and then to improve the harmonization among NACE Rev. 1, CPA, PRODCOM, CN, CPV, ...
- To raise the level of comparability among that different product nomenclatures.
- To control the number of detailed items in the different groups and to ensure that the groups are well balanced.
- To control the lexicon-semantic coherence among headings (CPA), sub-headings (PRODCOM) and the detailed items (CN, CPV, ...).
- To build a complete product (goods and services) classification to be used as a basis in different surveys and which provides a framework for the comparison of various kinds of statistics dealing with goods and services: production, domestic and foreign trade, prices, etc.
- To decrease the burden of enterprises in filling in survey forms.
- To have an European handbook of all products -activity nomenclatures.

In Italy I prepared a new version of integrated products classification: CPATECO 1996 where the CN 96, PRODCOM 96 and the list of CPV Services are incorporated in CPA.

The CPATECO 96 is structured as a hierarchical file containing about 18000 items. CPA 96, PRODCOM 96, CN 96, CPV are integrated in a "mega-structure" where:

- CPA items are as headings,
- Most of the PRODCOM 96 items are sub-headings symbol (-)
- The PRODCOM 96 items that represent a breakdown of a CN 96 item are distinguished by the symbol (..)
- CN 96 items describe products in the details, in fact, they generally represent detailed breakdowns of PRODCOM and before the description there is the symbol (.),
- The items of CN 96 that exactly coincide with PRODCOM 96 are distinguished by the symbol (=).

With respect to CPATECO codes, the extension of the CPA codes has been made in the following way:

- If the CN 96 products do not belong to PRODCOM 96 list, e.g. agricultural products, two extra digits have been added to CPA code, so to obtain the expanded eight - digit CPA code (emulation of PRODCOM),
- If the CN 96 products are considered in PRODCOM 96 list, and if one CN product corresponds exactly to one PRODCOM product, then the CPA extended code coincide with the PRODCOM code,
- If a group of CN products represent a detail of a PRODCOM item, two serial digit (from 01 to 99) were added to the PRODCOM code, so as to obtain the CPA expanded ten -digits CPA code.

Airlines Characteristics and Performance Measurement: An International Comparative Study

Tim Coelli (CREPP, University de Liege, Belgium and CEPA, University of New England)

Sergio Perelman (CREPP, University de Liege, Belgium)

Elliot Romano* (CREPP, University de Liege, Belgium)

Over the last two decades, international airline companies have faced a worldwide deregulation process which has forced them to become more efficient and competitive. The object of this paper is to analyze how different airlines have adapted to these changes.

We adopt an approach which involves the estimation of a best practice production function using panel data. The panel data consists of a sample of 32 airlines, selected from North American, Asian, European and Oceanic countries over a 14-year period, ranging from 1977 to 1990. The technical efficiencies of each airline in each year are measured relative to this estimated frontier.

However, one major problem associated with international comparison of technical efficiency degree lies in the fact that environmental differences may account for part of the observed efficiency differentials. In the airline case, the three main factors often mentioned in that respect, are the stage length, the weight load factor and the average aircraft capacity.

There are a number of different ways that one may deal with environmental differences. One early attempt to account for these environmental factors is suggested by Forsyth et al. (1986), who adjus the output measure prior to any estimation of the production frontier. A second approach is to include the environmental factors directly into the production function (Barla and Perelman, (1989); Good et al. (1993)).

In this paper, we consider an alternative approach where we specify a stochastic production function for international airlines in which the technical inefficiency term is

expressed as an explicit function of a number of environmental variables, such as those described above.

The model is estimated using the maximum likelihood method. The estimates of parameters related to the production function inputs as well as those associated with the environmental factors explaining the inefficiency are computed in a one-stage process. Technical efficiency predictions are calculated in the usual manner, and then, in order to make "environment-neutral" international comparisons possible among the different carriers, the predictions are then adjusted so that they measure the performance of each airline under a specific common set of environmental conditions.

These adjusted efficiency indicators may then be viewed as being primarily an indicator of managerial performance, given that the gross efficiency predictions have been "purged" of the major environmental influences.

Microsimulation Models - Evaluating the Economic Effects of the Corporation Tax Reforms

Outi Kröger* (Government Institute for Economic Research, Finland)

Finland is one of the few countries where corporation microsimulation models have been used for administrative decision making. Initially the development of the model was carried out by the Ministry of Finance. Presently the Government Institute for Economic Research has the responsibility of up-dating and further developing the existing models.

The most important use of these models has been to analyse the effects of the reform of corporate income tax. The corporate income tax model gives the first impact of the tax law changes. The database that the model uses comprises 4800 corporations solely from administrative files. The sample covers 75 per cent of the turnover of corporations.

The model has been planned for estimating the effects of the change from one tax regime to another - from dividend deduction system to imputation system.

The structure of the model is based on the imputation system. In a sense the model is devided in three parts. The first part estimates the broad net income as a consequence of changes of tax parameters. Actually, this part of the model is equal to that of dividend deduction system. The second part calculates the minimum income derived by the imputation system. The third part compares these two income and uses the earnings adjustments to achieve the minimum income. Finally the model calculates new taxes.

The Methodical Connection at the Enterprise and Personal Income Taxation

Outi Kröger* (Government Institute for Economic Research, Finland)

Rolf Myhrman* (Government Institute for Economic Research, Finland)

The Tax Reforms carried out in Finland in 1986-1993 have changed drastically the corporate income taxation. In 1990 Finland switched from the dividend deduction system to the imputation system. Another major tax reform was launched in 1993 in connection with the tax reform of capital income. Following the Nordic example Finland implemented a dual income tax system.

The entire income of the partnerships was divided among partners for income tax purpose. A partner's income from a partnership, income of self-employed persons and other dividends than those by distributed by listed companies are divided into capital income and earned income. Capital income is regarded as that part of the firm's income that corresponds to a 15 per cent return on the net worth of the company, with remainder being earned income. The data has to be exploited both at the enterprise and personal level.

After the tax reforms, the taxation of retained earnings is much more stricter in non-corporate enterprises than in corporations. This disadvantage is now being amended by granting the non-corporate enterprises the possibility to retain earnings at the lower tax rate in the same way as in corporations. Now, the research work is going on in order to offer the lawmakers adequate information on the economic impacts of the tax law changes.

The basic data used in the research in the research work is from the tax authorities' administrative files. The data compiles nearly 100000 non-corporate enterprises. The main purpose is to survey the multitude of enterprises that would be entitled to the lower taxation of retained earnings.

After connecting the enterprise and personal microsimulation models it is possible to calculate various possibilities how and to whom the support should be given.

Wages and Technology

Technology, Wages and Churning in Western Germany: Estimates from the IAB-Establishment Panel

Lutz Bellmann* (Institute for Employment Research, Germany)

Arnd Kölling (Institute for Employment Research, Germany)

Most theories of the impact of the implementation of new technology on employment predict that technological change involves the reshuffling of workers between firms implementing new technology and those business units located further away from the

technological frontier. However, based on data from the first and third wave of the German Establishment Survey (using the information of about 4 000 establishments interviewed 1993 and 1995). We estimated a structural model for the technology level, wage gap and churning, i.e. the same firms experienced both hirings and firings and showed that firms located on the technological frontier experience larger turnover rates than other units because of larger separation rates - rather than larger hiring rates - than other units.

Our results suggest that creative destruction processes associated to technological change involve the displacement and replacement of workers not only at the industry-level, but also at the level of each business unit. This means that creative destruction is ultimately endogenous to firms: they can either change their workforce in response to changes in the technology they use or upgrade existing jobs, i.e., via the retraining of workers and a more gradual introduction of new machinery. This choice between internal and external adjustment is also likely to be affected by conditions external to firms, such as the availability of workers matching the skills required by new technologies, the costs of dismissals associated to employment protection regulations and collective bargaining, constraints placed on the hiring process, etc.

Worker and Plant Wages in the Danish Private Sector: Estimates from a Multi-Level Model

Paul Bingley* (Denmark)

Niels Westgaard-Nielsen (Denmark)

It is well established that the standard human capital function can only describe part of the wage distribution. The remaining part is generally believed to be due to unobserved heterogeneity of workers and firms. The object of this paper is for the first time on Danish data to obtain an estimate of how much of the wage dispersion can be attributed to individual factors such as education and experience and how much to firm-related variables, which we will call a wage policy. The data allows us to follow persons and firms in a way such that it is possible to control for unobserved factors among firms/plants and persons.

The raw variance decomposition of log real wage attributes 14.6% to individuals and 74.2% to firms/plants. With our multi-level model we find that observables explain 20.4% of the variance; of what remains, 38% is attributable to worker heterogeneity, 5.8% to the match between worker and workplace, 26.1% to workplace. This leaves 9.8% unaccounted for.

The study can be motivated by several observations: The Scandinavian countries used to be known for their centralised wage bargaining. Denmark has never been as centralised as Sweden partly due to the large number of medium size firms compared to the much fewer and much larger firms in Sweden. However the centralised wage bargaining system has gradually been dismantled over recent years. The 90's have shown new tendencies

towards more decentralised and individualised wage setting in all Scandinavian countries. More decentralised wage bargaining does not necessarily lead to more wage dispersion within and between firms.

In its most extreme form, a centralised wage bargaining system means that all employees receive a wage according to a fixed scheme that is common for all firms. This would leave no room for a firm specific wage policy, since all firms would have to follow the same wage policy. In regression terms this would mean that the wage could be explained by only individual characteristics, observed as unobserved. It would also mean that workers could only gain by moving firm if they at the same time were promoted. If, on the other hand, there is a substantial element of firm-specific wage determination we would expect that the individual characteristics can only explain a small part of the wage dispersion. This would mean that workers could obtain a better wage rate for a similar job in other firms. The result is search and subsequent job mobility.

The high gross turnover rate for Danish private sector workers (29.4% year-on-year) indicates that the latter picture is the most relevant. The high Danish turnover rate measured as the sum of hires and lay offs is close to the figures seen for the US and makes one conclude that the flexibility of the Danish labour market resembles more the US labour market than the archetype of European regulated labour market. First of all, there exists very little protection against dismissals for workers in Denmark. Workers may in principle be dismissed without notice. Only white collar workers have extended notices according to their seniority. In return, there is a generous unemployment insurance system, with relatively high compensation rates for the low wage earners and very long benefit periods. This system is not experience rated at all with the result that employers do not meet any direct cost when they fire people. This has a definite impact on the mobility pattern.

In a number of recent reports on the labour markets of the European countries (see for example OECD, 1993) it has been argued that a relatively narrow wage dispersion is one of the obstacles preventing increasing employment. The explanation put forward is that the wage distribution is too narrow to allow for the employment of people who are not as productive as those already employed. The overall constraining factor is clearly a minimum wage or what could be equally constraining a high welfare payment. But the wage dispersion of the individual firm may also become a constraint in the sense that firms may use a technology that only employs workers above a certain wage level. One of the main problems in this discussion has been that most of these arguments have been supported by fairly aggregate data. There are, however, only a few datasets that actually allow for statements on the nature of the wage distribution at the firm or work place level. The present study does only give a partial answer to the extent to which plants have their own wage policy. However, it is believed that we provide some of the groundwork for future research.

Decomposing the wage variance is the first step towards analysing a number of interactions between plants and workers. We can mention mobility between plants and the high turnover rate in some countries (US and Denmark). For such studies it is

essential to have information on plant-level wages and matches between plants and workers.

For the first time we have access to data that enables us to follow a large sample of work places and all of their work force for up to 12 years. That gives us a unique opportunity to distinguish between plant, worker and plant-worker match effects on wage determination. The data are very rich in a number of ways. The most important is that it makes it possible to identify the link between plants and workers over time. Furthermore, it has some plant information: number of employees, number of different types of workers working in the plant, and the number of hirings. It would be desirable also to have economic information on firms, but this is not yet available.

Effects of Firm Performance and Technology on Wages: Evidence from Cross-Sectional Matched Worker-Firm Data

Martin Boon* (Statistics Netherlands, Deparment of Statistical Methods)

Recent empirical studies on wage determination stressed the existence of inter-industry wage differentials of employees with comparable qualifications performing similar tasks. This paper investigates the impact of firm performance and technology use on worker wages in the Netherlands manufacturing industry. Our empirical analysis uses cross-sectional worker-firm data which is created by joining the Netherlands Wage Survey, the Production Survey, the R&D-Survey and the Survey of Advanced Manufacturing Technology. The results show that firms that have the highest R&D-intensity and that have the highest labor productivity pay their workers the highest wages, when controls for worker quality are included. Finally we found that the use of advanced manufacturing technology have no significant influence on the wages of workers.

Executive Compensation and Tournament Theory: Empirical Tests on Danish Data

Tor Eriksson* (Department of Economics, Århus School of Business, Denmark)

The purpose of the paper is to add to the small empirical literature on the theory of tournaments as a theory of executive compensation. We test several propositions of tournament models on a fairly rich data set provided by a consulting firm engaged in compensation consulting. The data set is an unbalanced panel containing information about 2600 executives in 260 Danish firms (per year) during an four year-period. In addition to individual annts? Is the pay dispersion affected by the number of tournament participants? Is the average pay lower in firms with more compressed pay structures? Does wider pay dispersion enhance firm performance?

The Effects of Advanced Technologies on Wages and Employment: Experiences from Finland Using Establishment and Worker-Enterprise Data

Seppo Laaksonen* (Statistics Finland)

Jari Vainiomäki (Department of Economics, University of Tampere, Finland)

We study the effects of technology on establishment level wages and employment using a classification of the technology levels of industries.

The analyses will be conducted using the two micro datasets constructed at Statistics Finland: (i) a pooled cross-sectional data file of industrial establishments (DIE) for 1974-93, and (ii) a longitudinal worker-enterprise database (WEDB) for 1988-92.

The DIE gives wages separately for manual (blue-collar) and non-manual (white-collar) workers. We have analysed changes over the time period 1974 to 1993 in wage distribution across establishments and in technology effects on wages. The technology wage premiums have been estimated using wage equations with available explanatory establishment variables in DIE on one hand, and adding worker-based variables from the WEDB on the other. The latter analyses, much more detailed ones, have been done for five years only which are very interesting in Finland because of dramatic changes in economy.

The results do not appear to show a straightforward connection between the average wages of manufacturing establishments and the technology level of their industries as far as the high, medium-high or medium-low technology is concerned. However, the establishments in industries with the lowest technology have paid lower wages during the whole period. There are several interesting detailed results arising from explanatory variables.

Keywords: manual and non-manual workers, technology intensity, wage equations

Productivity, Performance, Factors and Relationships

R&D Investment and Public Technology Subsidies

Petri Niininen* (Helsinki School of Economics, Finland)

The broad consensus of opinion among economists is critical of subsidies. This is based on the premise that well functioning markets achieve optimal outcome. R&D subventions have some unique features different from subsidies in general. Unlike production subsidies, R&D subsidies often improve not only the profitably of the subsidized firm but also the profitability of rival firms. This is related to the externalities inherent in R&D

activities. Externalities may lead to situations where private incentives to conduct R&D are lower than social incentives. Also, strategic trade policy issues may call for R&D subsidies. These features make technology subventions a useful bench mark in analyzing the efficiency of industrial subsidies in general. If subsidy policy fails to perform in the case of R&D subsidies, it is very unlikely to perform well in other forms of subsidies.

The purpose of this paper is to analyse how the sources of financing, especially technology subventions, affect R&D investment. Followed by an introduction and the theoretical framework in section one, the dataset is described in section two. Methodology, the estimated model and results are reviewed in section three. Section four concludes the paper.

The Accumulation of R&D-Capital and the Dynamic Performance of Manufacturing Firms

Tor Jakob Klette (Statistics Norway and the Norwegian School of Economics)

Frode Johansen* (Statistics Norway)

We examine the patterns of R&D investment and the empirical relationship between R&D investment and performance using an unusually rich set of plant and firm level panel data. Considering the patterns of R&D investment, we argue that a model which allows for a positive feedback from already acquired knowledge to the productiveness of current research fits the empirical evidence better than standard models which treat knowledge accumulation symmetrically to the accumulation of physical capital. The econometric model is econometrically simple and less data-demanding than the standard framework. Our empirical analysis finds a significant positive effect of R&D on performance and a positive feedback effect from the stock of knowledge capital. We also calculate the depreciation rate the return on knowledge capital.

R&D and Productivity in the Manufacturing Industry: Evidence from Firm-Level Data for Finland

Kai Husso* (Statistics Finland)

The study was concerned with the connections between R&D and productivity in Finnish manufacturing firms. The analysis was based on the Cobb-Douglas production function modified to incorporate a variable describing R&D. our specific concern was with estimating elasticities of production function parameters and particularly with analysing the relationship between R&D and productivity.

The panel data covered the period between 1987 and 1993. The methods used in the measurement of the production function differed in terms of whether the estimates of elasticity were based on time series or cross section data. As regards the measurement of R&D productivity, the variable for R&D in the panel material was R&D capital.

The results suggested that industrial R&D has a clear positive and statistically significant impact on productivity. The panel's within-firm estimate for R&D capital elasticity was 0.08 and the total estimate 0.10. The panel's cross section estimate for R&D capital elasticity were in the range of 0.06 - 0.16. The results were parallel regardless of the methods of measurement employed or the values of the variables. It was found that R&D has a significantly greater impact on productivity increased during the period under review, particularly in the early part of the 1990s. The same trend was evident in both the hi-tech sector and other branches.

The generalizability of the results was undermined by problems of representativeness and the fact that the data comprised only a small portion of industrial companies with R&D operations. an important asset of the panel data was that it allowed an examination of the connection between R&D capital and productivity within the same firms over time. It also made it easier to take account of the time lags between R&D and production.

Concentration, Productivity and Technological Innovativeness of the Manufacturing Enterprises in Italy

Mauro Politi* (National Statistics Institute of Italy)

Piero Taccini* (National Statistics Institute of Italy)

The research described in this paper has the aim of contributing to know the structure of the industrial system in Italy in the period between 1985 and 1993.

The core of the study concerns the relations between concentration, productivity and technological innovativeness and their influence on the stability of the industrial system.

The concentration, defined as the level of domination of few large enterprises in a given economical activity, is a synthetic indicator of the structure of the market and therefore of the influence of one or more enterprises on it.

The productivity of the enterprises, define as the relation between the resources used the whole results obtained, gives a description of the operational conditions of the industry in the context of the relative efficiency of the manufacture sector (the best mixture of the production factors).

The technological innovativeness, defined as the use of products new or improved or as the use of process new or improved for producing goods for sale, allows the maintenance or the increase of the competitiveness of the enterprises in the market.

The study of the three mentioned variables for the Italian industrial system, gives informations on the grade of domination, efficiency and competitiveness of the enterprises.

The result of the analysis are derived by the use of panel of enterprises for the years between 1985 and 1993 that made innovations in term of products or production process in the years 1990 - 1992 (ad-hoc survey). Other data are obtained from the annual structural survey conducted on enterprises with at least 20 employees and operating in the manufacture sectors. The enterprises that are analysed by studying the relation between the index of concentration, index of productivity and innovativeness.

The longitudinal analysis is also conducted by size of the enterprises (in term of employment) and by economical activity at three digits level.

Keywords: longitudinal analysis, panel, innovativeness, technology, productivity, efficiency

Sampling, Registers, Evaluation

Sample Strategy of the New Italian Agricultural Survey on the Farms Structure Based on an Overlapping Sample

Marco Ballin* (National Statistics Institute of Italy)

Piero Demersio Falorsi* (National Statistics Institute of Italy)

The aim of this paper is to describe the new design of 1995 Agricultural Survey on the Farms Structure (ASFS) conducted by the National Statistics Institute of Italy (Istat) and base on an overlapping sample.

The goal of this new design, as it will be betters illustrated later, is to connect this survey with that one conducted in 1993 so to have some longitudinal information.

In 1993 this survey was conducted using a stratified simple random sampling. The strata were defined using the following variables:

- geographical region;
- the size of the farm defined in term of area utilised for agricultural purposes;
- variable describing the economic behaviour of the farm.
-

The total number of strata containing at least one unit was 1701.

The sample size, of 83,204 farms, was defined in order to satisfy the requirements on the sampling errors imposed by the European Community (EC). The allocation of the sample in the strata was defined using a generalisation for the multivariate case o the Neyman Pearson allocation.

In 1995 the AFSF has been redesigned in order to assure the comparability with other agricultural surveys and to better assure the goals defined by EC. The new sample is a stratified sample where each stratum is defined on the basis of the following variables:

- geographical region;
- the size of the farm defined in term of area utilised for agricultural purpose (with a new definition of the size classes);
- number of cattalos;
- number of swine;
- total number of sheeps and goats.
-

With the new stratification, the total number of strata containing at least one unit is 3257.

In order to satisfy the requirements on the sampling errors imposed by the EC the sample size is of 84,204 farms. The allocation of the sample in the strata has been done using the same procedure adopted in the 1993 survey.

The following simple selection procedure has been adopted in order to assure the maximum overlap with the 1993 AFSF survey:

- consider a given stratum of the 1995 AFSF and denote with: M, the stratum size, m, the farms to be selected in the stratum (with m # M); n, the number of farms selected in the 1993 (n # M);
- if n # m, the sample is constituted by: the n farms selected in the 1993 survey, and by (m - n) farms selected over the (M - n) farms not selected in the 1993 survey.
- if n > m, the sample is constituted by the m farms selected over the n selected in 1993 survey.
-

This selection procedure is very plain and easy to implement, but has the disadvantage that it is very difficult to compute the inclusion probabilities. In the paper we show a simple way to derive the inclusion probabilities and describe an estimation strategy based on the use of the calibration estimator.

The Advanced Technology Program's Business Reporting System: A Tool for Economic Evaluation

Jeanne W. Powell* (National Institute of Standards & Technology, USA)

Use of an electronic survey instrument to gather information on an annual basis about business progress and economic impact of advanced research projects cost-shared by government and industry (Economic Assessment office, Advanced Technology Program, USA).

Program evaluation has been an important part of the Advanced Technology Program (ATP)--a government-industry partnership--from its inception. The ATP's Economic Assessment Office (EAO) has implemented approaches for tracking short-term indicators of program results, while also developing new state-of-the-art evaluation of projects towards achieving their business and economic goals is a core part of ATP's program

evaluation framework. This comprehensive Business Reporting System consists of several parts. At the beginning of the project, project participants report on their planned application areas for the technology and strategies for commercialization. Annually they report on progress towards implementing their commercialization strategies and on short-term economic impacts of the projects, including early sales revenues, shortened R&D cycles, collaboration effects, intellectual property creation, and early job creation. Additional sections of the Business Reporting System now under development will focus on the post-ATP funding period, capturing technology diffusion. Over the following six-year period, participants will report three times, increasing the emphasis on broad-based impacts of the ATP-funded technology to the nation.

The Business Reporting System consists of a series of largely closed-ended questions and responses in electronic, database form. This database system is part of an integrated set of databases that supports comprehensive analyses covering all participants in ATP-funded research projects across nearly any desired subgroup. For short-term analyses, this integrated system provides a flexible analysis tool for generating reports of business progress of projects and early economic impacts. It also helps the ATP identify promising candidates for in-depth case studies of early ATP economic impact. In the longer term, the Business Reporting System will support efforts by independent research economists to measure broad economic benefits of this Federal program to the nation.

For the reporting period ending December 31, 1995, there were 395 organizations in the Business Reporting System. Although most of the participants/projects reporting to date are still in the early R&D phases, adequate data exists to 1) illustrate some of the types of analyses possible, 2) provide a snapshot of commercial opportunities that may be expected to result from this award portfolio and an approximate timeline, 3) give evidence that companies are taking necessary steps for successful future commercialization, 4) provide early indication that the non-proprietary information developed with ATP funding is contributing to a shared knowledge base, and 5) indicate patent filings attributable to the research projects. For projects which have received at least one year of funding, participants are reporting significant acceleration of R&D, stimulation of beneficial collaboration, and deepening of their R&D effort as a result of ATP funding.

The Advanced Technology Program, administered by the National Institute of Standards and Technology of the U.S. Department of Commerce, assists U.S. businesses on a cost-share basis to develop high risk, enabling technologies for the purpose of stimulating U.S economic growth and competitiveness of U.S businesses. Authorized by the U.S Congress in 1988, the ATP started operation with a small appropriation of $10M under the Bush Administration in 1990 and grew rapidly to a budget of $341M in 1995 under the Clinton Administration. To date the ATP has received 2,210 proposals in 22 merit-based competitions, and has announced 280 awards (178 for single-company projects and 102 for joint venture projects) for nearly $2 billion of research, with $970 million provided by the ATP. Although the ATP funds only research, funding decisions take into account business and economic merit of proposals as well as scientific and technical merit.

Stratification Variables and Business Dimension: Some Analyses for Defining Activity Criteria

Luca Schionato (University of Bergamo, Italy)

Christine Butti (University of Bergamo, Italy)

Silvia Biffignandi* (University of Bergamo, Italy)

The statistical register of businesses is built according to the standards of the European Community law n. 2186/93. This law requires, for each business and local unit, the inclusion of those variables by which it is possible to measure the dimension of the economic units. The following variables are requested explicitly:

- the number of dependent and independent workers
- the total sales
- the net profits
-

Generally speaking, one of the most important aspects of the construction of a register which is to be used for statistical and economic purposes, is the correct evaluation of the dimension of the businesses which is relevant to the choice of stratification variables.

The above-cited law also requires the statistical register of businesses to be built by making use of the information coming from the administrative registers available in each country belonging to the European Community.

In Italy, there are several administrative registers that can be employed for this purpose. They are: the Business Register of the Chambers of Commerce, the Social Security register, the Compulsory Insurance register, the Tax register, the electrical and Telephone society register.

Each of these sources has at disposal dimensional variables such as: number of workers, total sales, wages and salaries, number of local units, consumption of electricity etc...

The analysis of the relations existing among these variables is a subject of great interest, because it is relevant to the designing of models for the detection of outliers and incorrect data and for the missing data estimation. Moreover, it is by these dimensional variables that is possible to determine the state of "activity" of an economic unit and consequently its inclusion in the register which contains only active units.

In the report to be presented, it is given a preliminary evaluation of the problem in the Italian context; some general considerations are presented together with results obtained by processing dimensional data gathered from the registers listed above and which refer to units of selected Italian province. the analysis will then concentrate on the determination of threshold values which allow to define a units as active. the starting point of the analysis are the rules proposed by the European Community, which establish the state of activity of a business on the basis of a minimum amount of total sales. we

believe these rules not be adequate for the Italian context so that it is necessary to develop a series of alternative hypotesis about the available variables.

Special Features in Sampling Desings of Business Surveys

Ismo Teikari* (Statistics Finlands)

Surveying businesses has many special features at the same time as it has many common features with social surveys. In my presentation I will concentrate on the special features.

One of the most interesting features in business surveys is the very skewed distribution with many small businesses and very few large businesses. The Simple Random Samling is hardly ever a good procedure for surveying businesses, because the large businesses contribute generally much greater to estimates than small businesses. The Probability Proportinal-to-Size Samplings and the Stratified Samplings according to the size measures are the most suitable schemes in business surveys.

Another important feature of business surveys is the definition of the sampling units in the frame and the elements that constitute the population. After the definition of population elements the frame units must be determined. If we are interested in income, outlay or financial statistics the Institutional Unit (Enterprise) is generally the preferable one otherwise Kind-of-Activity Unit or Establisment could be one to be preferred. The reporting unit is not always the same as the statistical unit either in business surveys.

The third feature I will present is the response burden which is distributed unevenly when surveying businesses randomly in the longitudinal and the cross section samplings. When the greater part of samples are drawn from a single frame it is possible to coordinate the business samples and so to make Response burden more even. The use of permanent random numbers is a recommended method in coordinating business samples. When a panel study is needed we can use constant shift rotation methods in sampling. In the business register of Statistics Finland we are preparing the coordination system by which it is possible to coordinate both longitudinal survey samples and cross sectional samples.

The frame most often used in business surveys is the Business Register. This is the frame which directly identifies the individual elements of the population. The devices for making contacts and some important auxiliary variables of the elements are also included in business registers. Naturally there are also some frame imperfections. For example, the rapid changes in small businesses creates under- and overcoverage in the frame.

Performance, Exports, Success

Exports and Success in German Manufacturing

Andrew B. Bernard (Department of Economics, M.I.T., Cambridge, United Kingdom)

Joachim Wagnern* (Institute of Economics, University of Lueneburg, Germany)

While Germany has a very open, export-oriented manufacturing sector, to date there has been little or no research on the role of exporting in German firm performance. This paper documents the significant differences between exporters and non-exporters and attempts to identify the sources of these disparities. Exporters are much larger, more capital- intensive, and more productive than non-exporters. However, the bulk of the evidence suggests that these performance characteristics predate entry into the export market. We find no positive effects on employment, wage or productivity growth after entry. Our results provide confirming evidence that success leads to exporting, rather than the reverse.

Keywords: trade, productivity growth, export-led growth.

Growth Patterns and Economic Performance of French Manufacturing Firms in 1993

Bernard Paranque* (Banque de France)

Since early 1994, there have been signs of an upturn in economic activity. The strength and scope of the recovery depend to a large extent on the ability of companies to exploit their competitiveness, which is dependent on the decisions they take today, particularly where both tangible and intangible investments are concerned.

The aim of this article is to identify specific types of economic behaviour and to relate them to companies investment, and particularly intangible investment, decisions. It is first of all necessary to define competitiveness and to suggest a measurement indicator suited to aggregated accounting data. The link between competitiveness and profitability will be specified and the diversity of the companies will then be highlighted.

Statistical Analysis of "Balance" Ratios to Evaluate the Performances of Enterprises

Isabella Santini* (Universita di Roma "la Sapieza", Italy)

The evaluation of performances of enterprises, necessary in order to plan correctly and profitably firms' activities, is generally based on a careful analysis of economic balance which describes both economic and financial characteristics of enterprises management.

Generally speaking, the aim of balance analysis is to transform data into information, because the act of computing specific ratios must, necessarily, be followed by a deep evaluation of the results achieved, by means of statistical techniques which help to express opinions on dynamics and decisive factors which characterize the performances of enterprises.

In particular, the main aim of analysis of enterprises balance ratios is to come to an opinion about the rank of a firm compared with the ones achieved by competing firms with reference to some relevant aspect such as profitability, liquidity, etc.

Such aim can be reached by computing, with reference to specific balance ratios distributions (sample or total) of a set of homogenous enterprises, characteristic statistical indices such as mean, standard deviation, deciles, and so on., which definitely allow performance comparisons among different enterprises. Nevertheless, these indices do not point out the ideal results which each firm should aim at.

Interpolating techniques try to overcome this limit: as a matter of fact they identify a theoretical model which is the best approximation of the observed distribution and which offers additional information in respect to the one obtained by computing traditional descriptive indices.

The purpose of this paper is therefore to analyze the distributions of the most important balance rations for an homogenous set of enterprises (Sample Mediobanca, 1995) and to investigate the suitable theoretical model.

The identification of these models will be based on the measures of skewness and kurtosis according to the method suggested by Pearson (Elderton e Jonson, 1996; Shapiro e Gross, 1981), and will allow to draw the probability distribution of each ratio in order to compare the ranking of enterprises with reference to specific financial and economic aspects.

Competences, Innovation and Firm Performance

Aija Leiponen* (Research Institute of the Finnish Economy (ETLA), Finland)

This empirical study focuses on the economic implications of competences on the firm level. Economic importance of knowledge accumulation in the form of technological change has been emphasized in studies of both macroeconomic growth and firm performance. Technological change is to a large extent driven by learning and innovation. This study examines the role of acquired competences in knowledge accumulation through innovation, and as a determinant of firm performance.

Competences are measured with educational fields and levels, and firm-specific experience (tenure). Their effects on the probability of innovation of firms are estimated with probit analysis. Then the implications of competences and innovation for profitability of firms are assessed with dynamic panel data approach.

Competences are found to be significant determinants of innovation and profitability. Product and process innovations are determined by different types of educational competences, and accumulated experience is relevant in particular for process innovation. With regard to profitability, considerable complementarities between different types of competences, and between competences and innovation are found.

Panels, Methods

Trading Days Problem about Forecasts in Management

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A fundamental task in statistics is to uncover and highlight patterns thhow to use a specific method into the field of management to handle such data.

In first part, we present the calendar variations, especially the seasonal effects and trading day effects. Christmas day is always in December, but not always on Sunday. Moreover, such an approach is relevant in practice in so far as it is possible to quantify, or rather estimate, its effects.

The seasonally adjusted series of monthly sales for hypermarkets and supermarkets are significative.

A SAS macro is used for the trading day correction and an economic time series is analysed through this method.

Small Sample Properties of Power of F Test under Two-Way Error Component Structure in the Analysis of Panel Data

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In this paper we investigate properties of the power function of the generalized least squares F test for linear hypotheses under regression models with two-way error component model. The covariance structure of the model depends on the correlation coefficients ρ_1 and ρ_2 corresponding to the random effects.

Panel data applications frequently utilize the two-way error component regression model. Such a model may be expressed as

$$y_{it} = \alpha + x'_{it}\beta + \mu_{it} + \lambda_{it} + \nu_{it} \qquad i = 1, 2, ..., N; \qquad t = 1, 2, ..., T$$

where y_{it} denotes the value of the response variable at the time t on the ith individual, α is a scalar, x_{it} is a k x 1 unknown vector of regression coefficients. The error components $\{\mu_{it}\}$, $\{\lambda_{it}\}$ and $\{\upsilon_{it}\}$ are assumed to be independent of each other, and each in turn assumed to be independent and identically distributed as $N(0, \sigma_\mu^2)$, $N(0, \sigma_\lambda^2)$ and $N(0, \sigma_\nu^2)$, respectively ($\sigma_\mu^2 \geq 0, \sigma_\lambda^2 \geq 0, \sigma_\nu^2 \geq 0$).

In general, we show that the power is monotonically increasing function of $\rho_1(\rho_2)$ in a region which is close to the $\rho_1(\rho_2)$ axis, and a monotonically decreasing function of $\rho_1(\rho_2)$ in a region close to the $\rho_1(\rho_2)$ axis.

Approaches to a Long-term Forecasting of Principal R&D Indicators in Russia

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Efficiency of the national economy, defense potential, state of the spiritual and political culture in Russia are to a great extent defined by the level of science and technology (S&T) development. The key element of reforming S&T management system is improving of research and development (R&D) funding mechanism as it stated in the "Doctrine of Development of Russian Science". It should ensure first of all financing of priority fields of vital importance for the country. There could be distinguished four main kinds of demand on R&D in Russia: Government budget, R&D intensive industrial production, adopting of foreign technologies in Russia, and foreign companies.

It is evident that the shares of those demands will strongly depend on the stage of economic reforms. At the first stage (under condition of economic crisis) the greatest share belongs to the Government budget. It is caused by the necessity of adjusting national S&T to new market environment and of choosing priority fields of research.

Budget constraints will not allow to sufficiently finance priority research. However, without this it is impossible to provide a transition to the second stage of reforms (1998-2003) which considers modernisation of industries. On that stage the share of industry

and commercial sector is to be increased. The Government will both finance priority fields of S&T, to create environment for investing in R&D, promote competition through financing R&D projects, programmes, etc.

At the third stage (after 2004) there should be created conditions for a large-scale implementation of post- industrial technologies. The role of the Government will then consist in regulating priority fields of science and creating preconditions for foreign investments in those fields.

At each stage basic macroeconomic indicators - such as GDP, national income, etc. - are supposed to achieve definite levels. In their turn the total budget expenditure depend on GDP. It is difficult to forecast relation between GDP and Government budget, as well as the budget distribution by line of expenditure. In such case it is useful to build up an imitation model, which allows to change depending on the situation set of input parameters for the model, and to forecast an output parameters (in our case volume of budget expenditure on R&D).

The paper is focused on the methodological approaches based on the analysis of population of R&D- performing institutions in Russia and longitudinal analysis of principal R&D indicators.

Starting from analysis of wages and employment indicators as input parameters for the model we can forecast volume of funding needed for budget R&D financing. The forecast of salary should be calculated on the basis of several scenarios dependend on external factors (such as inflation rate et al.)

Variants of wages forecasts are calculated with regression or factor models on the basis of inflation rate forecasts. The employment forecast is obtained from traditional extrapolation (trends, decomposition) models. Taking into account that share of wages in total intramural R&D expenditure is more or less stable (34- 40%) the total R&D expenditure can be forecasted. Varying input parameters it can be provided a set of output forecast estimations.